

ARTESYN AVD75B-48S05 SERIES

75 Watts 1/16 Brick Converter



PRODUCT DESCRIPTION

Advanced Energy's Artesyn AVD75B-48S05 series is a single output DC/DC converter with standard sixteenth-brick outline and pin configuration. It delivers up to 15A output current with 5V output. Above 91.5% ultra-high efficiency and excellent thermal performance makes it an ideal choice to supply power in telecom and datacom.

AT A GLANCE

Total Power

75 Watts

Input Voltage

36 to 75 Vdc

of Outputs

Single

SPECIAL FEATURES

- Delivers up to 15A output current
- Ultra-high efficiency 91.5% typical at 15A load
- Wide input range: 36V to 75V
- Excellent thermal performance
- No minimum load requirement
- RoHS 3.0
- Basic isolation
- High power density
- Low output noise
- Startup pre-bias
- Remote control function
- Remote output sense
- Input under voltage lockout
- Output over current protection
- Output short circuit protection
- Output over voltage protection
- Over temperature protection
- Industry standard sixteenth-brick pin-out outline

SAFETY

- EN 62368-1
- EN / UL 60950-1
- CE Mark

TYPICAL APPLICATIONS

- Datacom
- Telecom



MODEL NUMBERS

| Standard | Output Power | Structure | Remote ON/OFF logic | RoHS Status |
|------------------|--------------|------------|---------------------|-------------|
| AVD75B-48S05B-6L | 75W | Baseplate | Negative | RoHS 3.0 |
| AVD75B-48S05-6L | 75W | Open-frame | Negative | RoHS 3.0 |
| AVD75B-48S05TL | 75W | Open-frame | Negative | RoHS 3.0 |

Order Information

| AVO75B | - | 48 | S | 05 | P | B | - | 6 | L |
|--------|---|----|---|----|---|---|---|---|---|
| ① | | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ |

| | | |
|---|----------------------|---|
| ① | Model series | AVD: high efficiency sixteenth brick series, 75: output power 75W |
| ② | Input voltage | 48: 36V ~ 75V input range, rated input voltage 48V |
| ③ | Output number | S: single output |
| ④ | Rated output voltage | 05: 5V output |
| ⑤ | Remote ON/OFF logic | Default: negative logic; P: positive logic |
| ⑥ | Baseplate | B: with baseplate; default: open frame |
| ⑦ | - | Need "-" for through-hole unit, to separate the data of voltage and pin length, omit for SMT unit |
| ⑧ | Pin length | T: SMT; 6: 3.8mm ± 0.25mm |
| ⑨ | RoHS status | L :RoHS 3.0 |

Options

None

ELECTRICAL SPECIFICATIONS

Absolute Maximum Ratings

Stress in excess of those listed in the “Absolute Maximum Ratings” may cause permanent damage to the power supply. These are stress ratings only and functional operation of the unit is not implied at these or any other conditions above those given in the operational sections of this TRN. Exposure to any absolute maximum rated condition for extended periods may adversely affect the power supply’s reliability

| Table 1. Absolute Maximum Ratings | | | | | | |
|--|-------|-------------|------|-----|------|------|
| Parameter | Model | Symbol | Min | Typ | Max | Unit |
| Input Voltage Operating -Continuous Non-operating -100mS | All | $V_{IN,DC}$ | - | - | 80 | Vdc |
| | All | | - | - | 100 | Vdc |
| Maximum Output Power | All | $P_{O,max}$ | - | - | 75 | W |
| Isolation Voltage ¹ Input to output | All | | - | - | 1500 | Vdc |
| Ambient Operating Temperature | All | T_A | -40 | - | +85 | °C |
| Storage Temperature | All | T_{STG} | -55 | - | +125 | °C |
| Voltage at remote ON/OFF pin | All | | -0.3 | - | 12 | Vdc |

Note 1 - 1mA for 60s, slew rate of 1500V/10s. Basic insulation, pollution degree 2

ELECTRICAL SPECIFICATIONS

Input Specifications

| Table 2. Input Specifications | | | | | | |
|--|---|--------------|-----|------|-----|------|
| Parameter | Condition ¹ | Symbol | Min | Typ | Max | Unit |
| Operating Input Voltage, DC | All | $V_{IN,DC}$ | 36 | 48 | 75 | Vdc |
| Turn-on Voltage Threshold | $I_O = I_{O,max}$ | $V_{IN,ON}$ | 31 | - | 36 | Vdc |
| Turn-off Voltage Threshold | $I_O = I_{O,max}$ | $V_{IN,OFF}$ | 30 | - | 35 | Vdc |
| Lockout Voltage Hysteresis | $I_O = I_{O,max}$ | | 1 | - | 3 | V |
| Maximum Input Current | $V_{IN,DC} = 36V_{dc}$ $I_O = I_{O,max}$ | $I_{IN,max}$ | - | - | 3 | A |
| Recommended Input Fuse | Fast blow external fuse recommended | | - | - | 5 | A |
| Recommended External Input Capacitance | Low ESR capacitor recommended | C_{IN} | 100 | 220 | - | uF |
| Input Reflected Ripple Current | Through 12uH inductor | | - | 20 | - | mA |
| Operating Efficiency | $I_O = I_{O,max}$ | η | - | 91.5 | - | % |
| | $I_O = 50\% I_{O,max}$ | | - | 90.5 | - | % |

Note 1 - $T_a = 25\text{ }^{\circ}\text{C}$, airflow rate = 400 LFM, $V_{in} = 48\text{Vdc}$, nominal V_{out} unless otherwise indicated.

ELECTRICAL SPECIFICATIONS

Output Specifications

| Table 3. Output Specifications | | | | | | | |
|---|--------------------------------|---|-------------------------|--------|------------|-------------|---------------------|
| Parameter | | Condition ¹ | Symbol | Min | Typ | Max | Unit |
| Factory Set Voltage | | $V_{IN,DC} = 48Vdc$ $I_O = 50\% I_{O,max}$ | V_O | 4.95 | 5.0 | 5.05 | Vdc |
| Output Voltage Line Regulation | | All | $\pm\%V_O$ $\pm V_O$ | - - | - - | 0.15 7.5 | % mV |
| Output Voltage Load Regulation | | All | $\pm\%V_O$ $\pm V_O$ | - - | - - | 0.15 7.5 | % mV |
| Output Voltage Temperature Regulation | | All | $\%V_O$ | - | - | 0.02 | %/°C |
| Total Output Voltage Range (Over sample, line, load, temperature & life) | | All | V_O | 4.9 | 5.0 | 5.1 | V |
| Output Voltage Trim Range | | All | V_O | 4 | - | 5.5 | V |
| Output Ripple, pk-pk ² | | 20MHz bandwidth | V_O | - | 40 | - | mV _{PK-PK} |
| Output Current | | All | I_O | 0 | - | 15 | A |
| Output DC Current-Limit Inception ³ | | | I_O | 17 | - | 30 | A |
| V_O Load Capacitance ⁴ | | All | C_O | 220 | - | 10000 | uF |
| V_O Dynamic Response | Peak Deviation Setting Time | 25%~50%~25% 25% load change slew rate = 0.1A/us | $\pm V_O$ T_s | - - | 90 50 | - - | mV uSec |
| | Peak Deviation Setting Time | 50%~75%~50% 25% load change slew rate = 1A/us | $\pm V_O$ T_s | - - | 110 100 | - - | mV uSec |
| Turn-on Transient | Rise time | $I_O = I_{O,max}$ | T_{rise} | - | 20 | - | mS |
| | Turn-on delay time | $I_O = I_{O,max}$ | $T_{turn-on}$ | - | 10 | - | mS |
| | Output voltage overshoot | $I_O = 0$ | $\%V_O$ | - | - | 5 | % |
| Switching Frequency | | All | f_{SW} | - | 350 | - | KHz |
| Remote ON/OFF Control (positive logic) | Off-state voltage | All | | -0.3 | - | 1.2 | V |
| | On-state voltage | All | | 3.5 | - | 12 | V |
| Remote ON/OFF Control (negative logic) | Off-state voltage | All | | 3.5 | - | 12 | V |
| | On-state voltage | All | | -0.3 | - | 1.2 | V |

Note 1 - $T_a = 25^\circ C$, airflow rate = 400 LFM, $V_{in} = 48Vdc$, nominal V_{out} unless otherwise noted.

Note 2 - Test condition: 10u tantalum($ESR \leq 100 m\Omega$)/1u ceramic capacitor; Figure 17.

Note 3 - Hiccup.

Note 4 - High frequency and low ESR is recommended.

ELECTRICAL SPECIFICATIONS

Output Specifications

| Table 3. Output Specifications, con't | | | | | | |
|---|--|-----------------|------------|--------|------------|-------------------|
| Parameter | Condition ¹ | Symbol | Min | Typ | Max | Unit |
| Output Over-voltage Protection ⁵ | Static Dynamic | V _O | 5.8 5.8 | - - | 6.7 7.0 | V |
| Output Over-temperature Protection ⁶ | All | T | - | 120 | - | °C |
| Over-temperature Hysteresis | All | T | - | 10 | - | °C |
| + Sense | All | %V _O | - | - | 5 | % |
| - Sense | All | %V _O | - | - | 5 | % |
| MTBF | Telcordia SR-332 Method 1 Case3, 80% load, 300LFM, 40 °C T _A | | - | 2.0 | - | 10 ⁶ h |

Note 5 - Hiccup: auto-restart when over-voltage condition is removed.

Note 6 - Auto recovery. See Figure 9, Figure 10 for the over-temperature protection (OTP) test point.

ELECTRICAL SPECIFICATIONS

AVD75B-48S05 Performance Curves

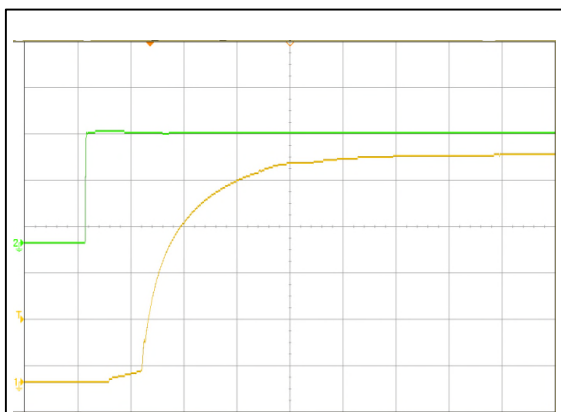


Figure 1: AVD75B-48S05 Output Voltage Startup Characteristic (10mS/div)
Ch 1: Vo (1V/div) Ch 2: Vin (20V/div)

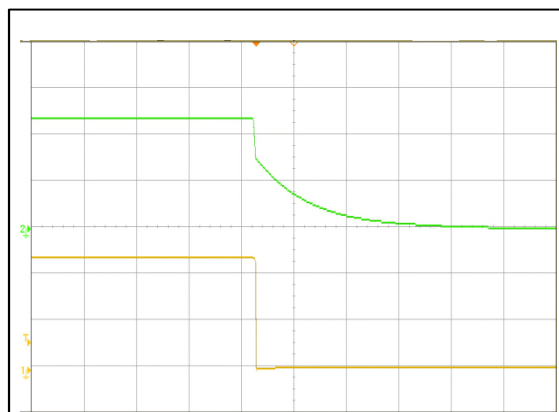


Figure 2: AVD75B-48S05 Turn Off Characteristic (20mS/div)
Ch 1: Vo (2V/div) Ch 2: Vin (20V/div)

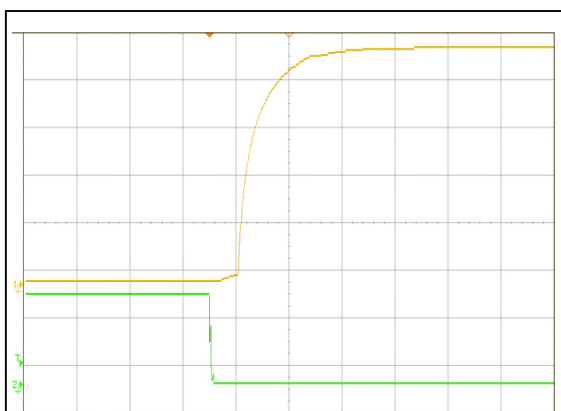


Figure 3: AVD75B-48S05 Remote ON Waveform (20mS/div)
Ch 1: Vo (1V/div) Ch 2: Remote ON (2V/div)

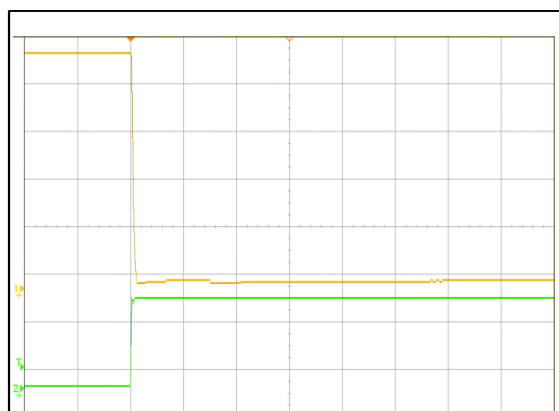


Figure 4: AVD75B-48S05 Remote OFF Waveform (10mS/div)
Ch 1: Vo (1V/div) Ch 2: Remote ON (2V/div)

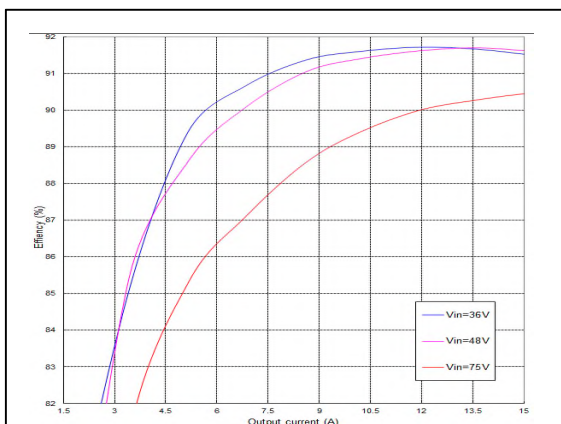


Figure 5: AVD75B-48S05 Efficiency Curves @ 25 °C, 400LFM
Loading: Io = 10% increment to 15A

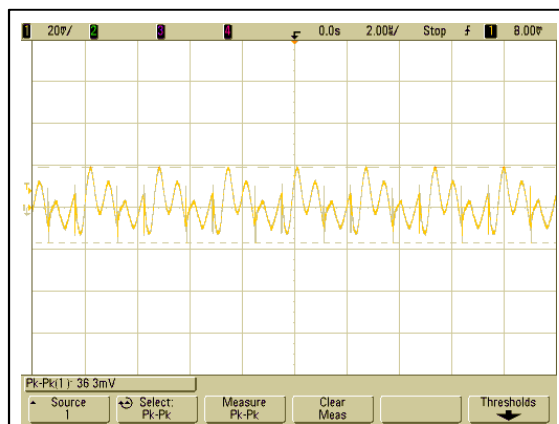


Figure 6: AVD75B-48S05 Ripple and Noise Measurement
Ch 1: Vo (2uS/div, 20mV/div)

ELECTRICAL SPECIFICATIONS

AVD75B-48S05 Performance Curves

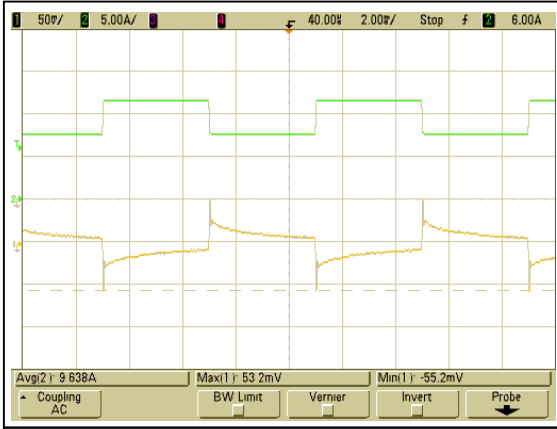


Figure 7: AVD75B-48S05 Transient Response (2mS/div) 0.1A/uS slew rate
Ch 1: Vo (50mV/div) Ch 2: Io (5A/div)

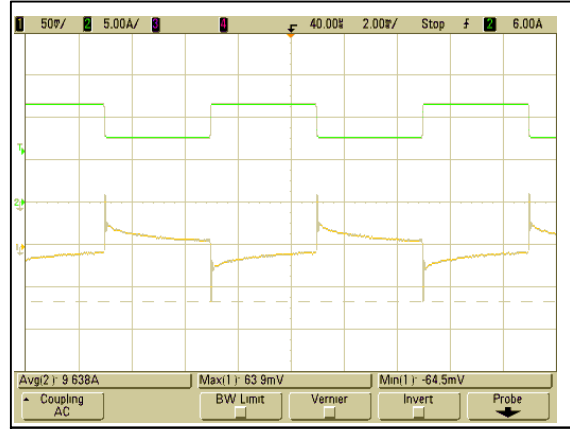


Figure 8: AVD75B-48S05 Transient Response (2mS/div) 1A/uS slew rate
Ch 1: Vo (50mV/div) Ch 2: Io (5A/div)

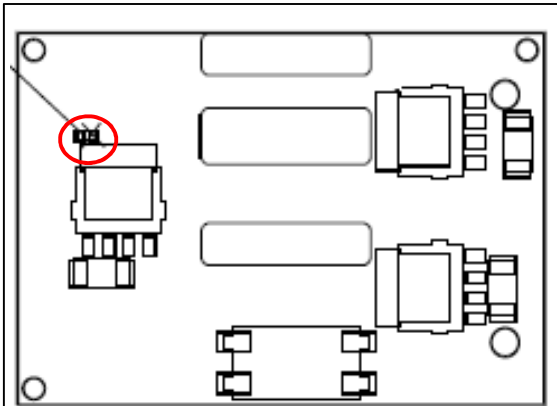


Figure 9: AVD75B-48S05 OTP test point (Open-frame module)

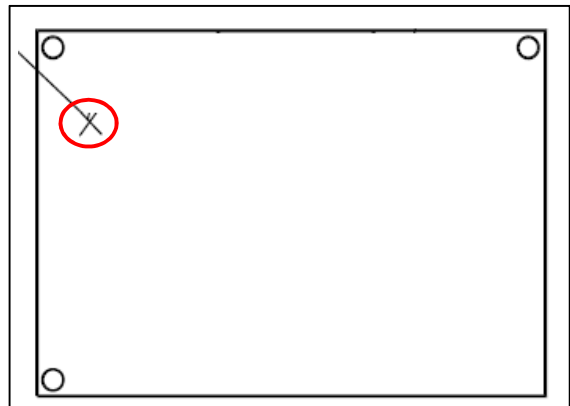
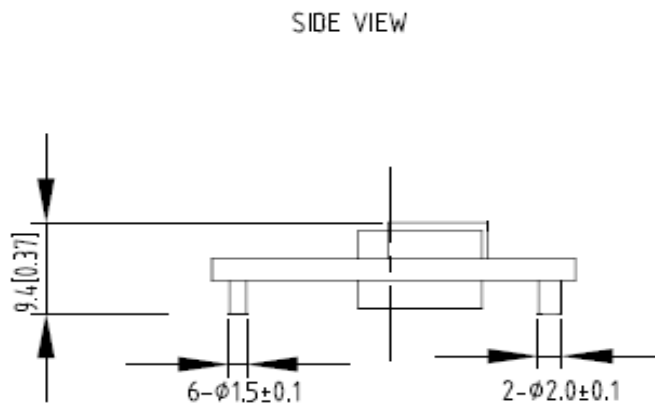
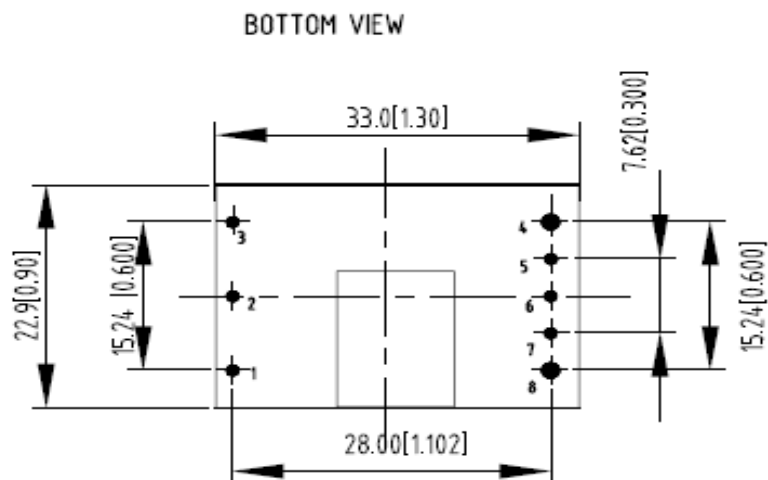


Figure 10: AVD75B-48S05 OTP test point (Module with baseplate)

MECHANICAL SPECIFICATIONS

Mechanical Outlines – Surface Mounted Module (unit: mm)



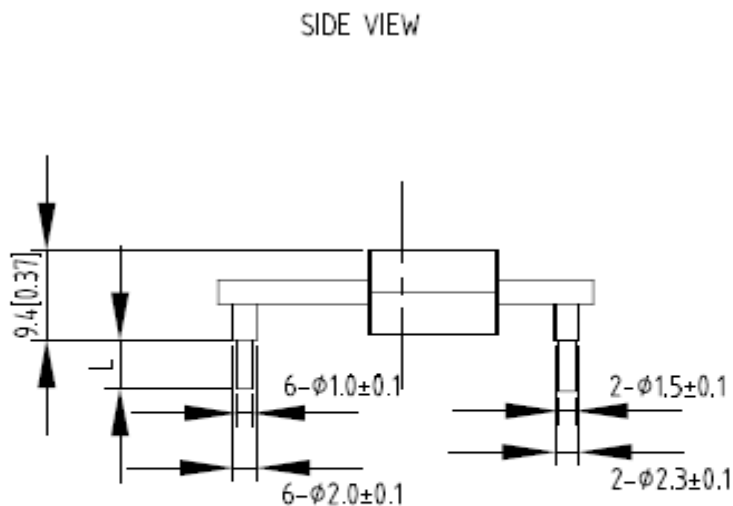
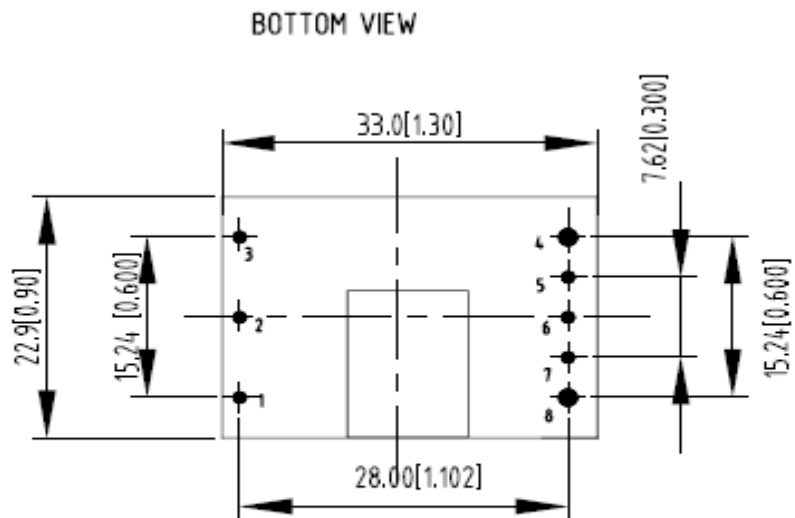
UNIT: mm[inch]

TOLERANCE: X.Xmm±0.5mm[X.XX in.±0.02in.]

X.XXmm±0.25mm[X.XXX in.±0.01in.]

MECHANICAL SPECIFICATIONS

Mechanical Outlines – Open-frame Module (unit: mm)



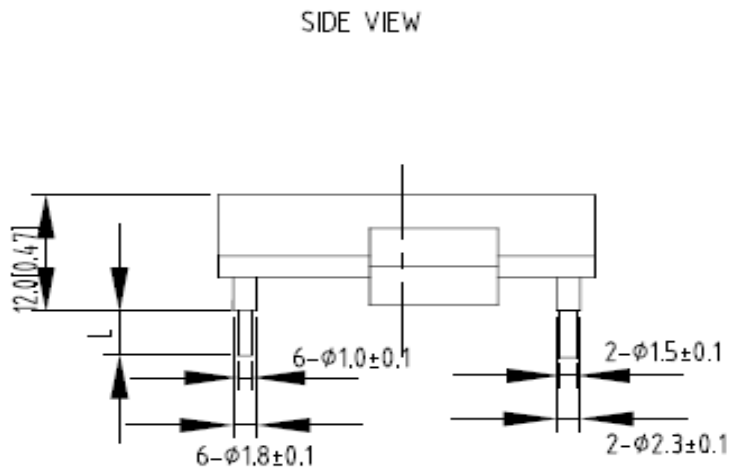
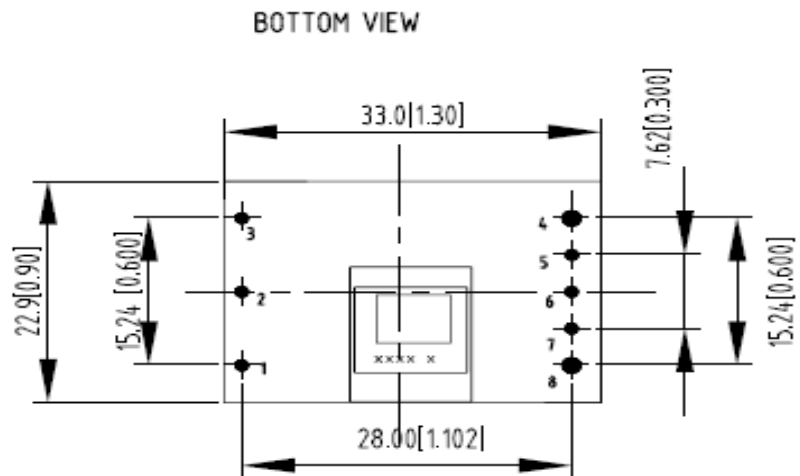
UNIT: mm[inch]

TOLERANCE: X.Xmm ± 0.5 mm[X.XX in. ± 0.02 in.]

X.XXmm ± 0.25 mm[X.XXX in. ± 0.01 in.]

MECHANICAL SPECIFICATIONS

Mechanical Outlines – Baseplate Module(unit: mm)



UNIT: mm[inch]

TOLERANCE: X.Xmm \pm 0.5mm[X.XX in. \pm 0.02in.]

X.XXmm \pm 0.25mm[X.XXX in. \pm 0.01in.]

MECHANICAL SPECIFICATIONS

Pin Designations

| Pin No | Name | Function |
|--------|---------------|-------------------------|
| 1 | Vin+ | Positive input voltage |
| 2 | Remote ON/OFF | Remote ON/OFF control |
| 3 | Vin- | Negative input voltage |
| 4 | Vo- | Negative output voltage |
| 5 | S- | Negative remote sense |
| 6 | Trim | Output voltage trim |
| 7 | S+ | Positive remote sense |
| 8 | Vo+ | Positive output voltage |

Pin Length Option

| Device code suffix | L |
|--------------------|---------------------|
| -4 | 4.8mm \pm 0.25 mm |
| -6 | 3.8mm \pm 0.25 mm |
| -8 | 2.8mm \pm 0.25 mm |
| None | 5.8mm \pm 0.25 mm |

MECHANICAL SPECIFICATIONS

Weight

15g typical, ± 3 g tolerance for open-frame module.

24g typical, ± 3 g tolerance for baseplate module.

ENVIRONMENTAL SPECIFICATIONS

EMC Immunity

AVD75B-48S05 series power supply is designed to meet the following EMC immunity specifications.

| Table 4. Environmental Specifications | | |
|---|--|----------|
| Document | Description | Criteria |
| EN55032, DC input port, Class A | Conducted and Radiated EMI Limits | / |
| IEC/EN 61000-4-2, Enclosure port, Level 3 | Electromagnetic Compatibility (EMC) - Testing and measurement techniques: Electrostatic discharge immunity test | B |
| IEC/EN 61000-4-4, Level 3 | Electromagnetic Compatibility (EMC) - Testing and measurement techniques: Electrical Fast Transient. DC input port | B |
| IEC/EN 61000-4-5 | Electromagnetic Compatibility (EMC) - Testing and measurement techniques: Immunity to surges - 600V common mode and 600V differential mode for DC input port | B |
| IEC/EN 61000-4-6, Level 2 | Electromagnetic Compatibility (EMC) - Testing and measurement techniques: Continuous Conducted Interference. DC input port | A |
| EN61000-4-29 | Electromagnetic Compatibility (EMC) - Testing and measurement techniques: Voltage Dips and short interruptions and voltage variations. DC input port | B |

Criterion A: Normal performance during and after test.

Criterion B: For EFT and surges, low-voltage protection or reset is not allowed. Temporary output voltage fluctuation ceases after disturbances ceases, and from which the EUT recovers its normal performance automatically. For Dips and ESD, output voltage fluctuation or reset is allowed during the test, but recovers to its normal performance automatically after the disturbance ceases.

Criterion C: Temporary loss of output, the correction of which requires operator intervention.

Criterion D: Loss of output which is not recoverable, owing to damage to hardware.

ENVIRONMENTAL SPECIFICATIONS

Safety Certifications

The AVD75B-48S05 power supply is intended for inclusion in other equipment and the installer must ensure that it is in compliance with all the requirements of the end application. This product is only for inclusion by professional installers within other equipment and must not be operated as a stand alone product.

Table 5. Safety Certifications for AVD75B-48S05 Series Module

| Standard | Agency | Description |
|----------------|--------|----------------------------|
| UL/CSA 60950-1 | UL | US and Canada Requirements |
| EN 60950 | TUV | European Requirements |
| EN 62368-1 | TUV | European Requirements |
| CE | CE | CE Marking |

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature

The AVD75B-48S05 series power supplies will start and operate within stated specifications at an ambient temperature from -40 °C to 85 °C under all load conditions. The storage temperature is -55 °C to 125 °C.

Thermal Considerations – Open-frame module

The converter is designed to operate in different thermal environments and sufficient cooling must be provided. Proper cooling can be verified by measuring the temperature at the test points as shown in the Figure 11. The temperature at these points should not exceed the max values in Table 6.

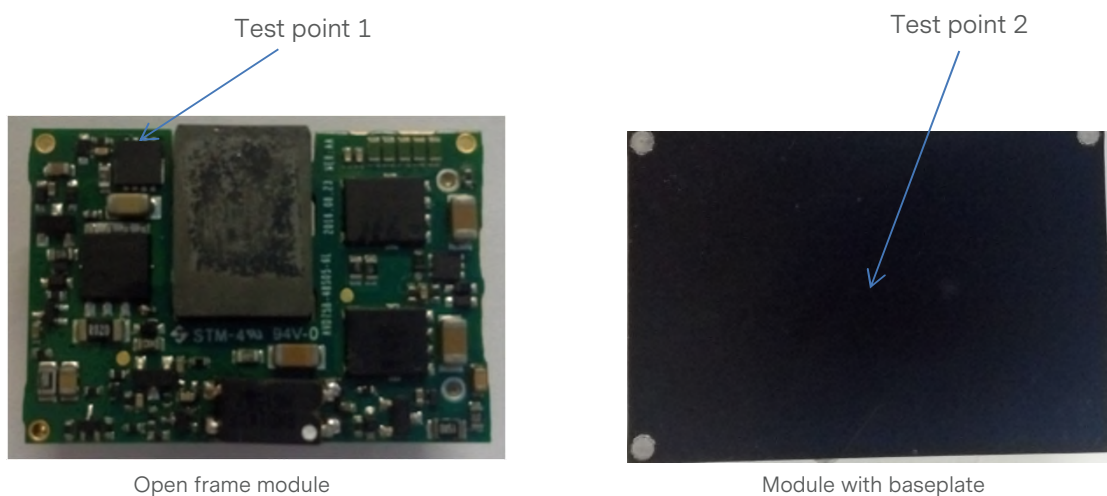


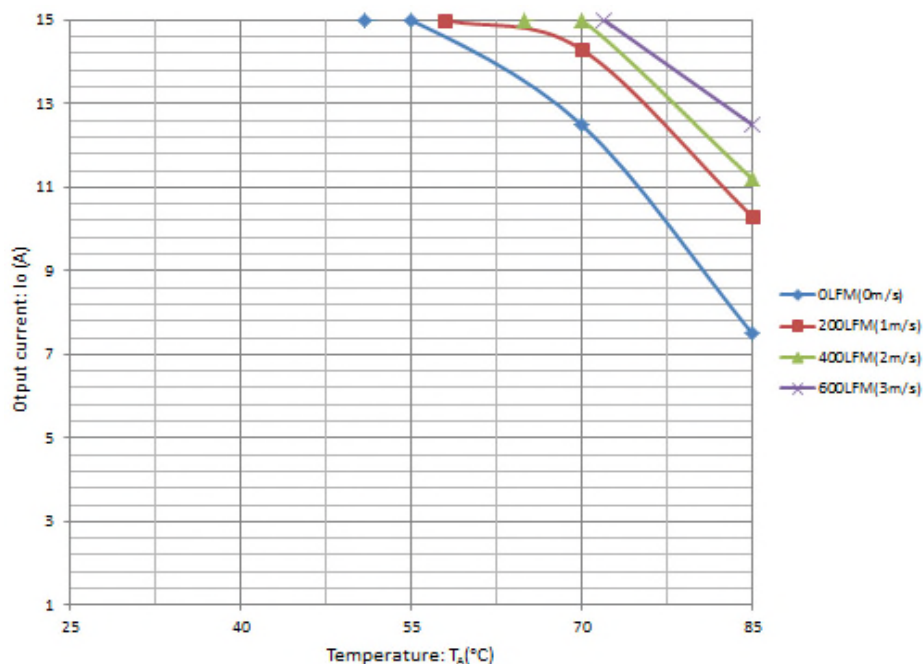
Figure 11 Module temperature test point

Table 6. Temperature Limit of the Test Point

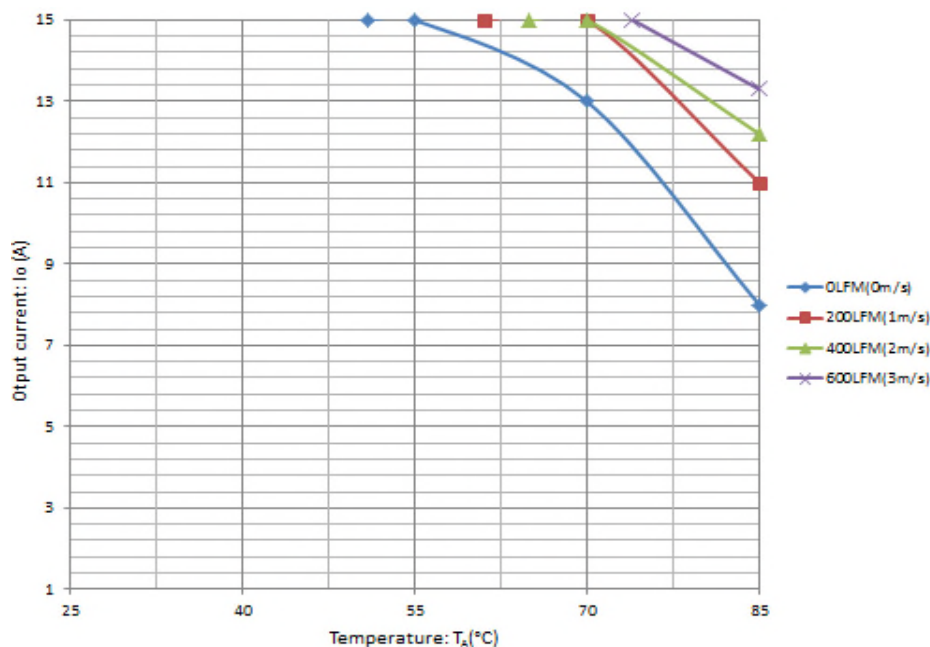
| Test Point | Temperature Limit |
|--------------|-------------------|
| Test point 1 | 115 °C |
| Test point 2 | 120 °C |

ENVIRONMENTAL SPECIFICATIONS

For a typical application, figure 12 shows the derating of output current vs. ambient air temperature at different air velocity.



AVD75B-48S05-6L and AVD75B-48S05TL



AVD75B-48S05B-6L

Figure 12 Output power derating, 48Vin, air flowing across the converter (from Vin- to Vin+)

ENVIRONMENTAL SPECIFICATIONS

Qualification Testing

| Parameter | Unit (pcs) | Test condition |
|------------------|------------|--|
| Halt test | 4-5 | $T_{a,min}$ -20 °C to $T_{a,max}$ +25 °C, 10 °C step, V_{in} = min to max, 0 ~ 100% load |
| Vibration | 3 | Frequency range: 5Hz ~ 20Hz, 20Hz ~ 200Hz, A.S.D: 1.0m ² /s ³ , -3db/oct, axes of vibration: X/Y/Z. Time: 30min/axes |
| Mechanical Shock | 3 | 30g, 6ms, 3axes, 6directions, 3time/direction |
| Thermal Shock | 3 | -55 °C to 125 °C, unit temperature 20cycles |
| Thermal Cycling | 3 | -40 °C to 85 °C, temperature change rate: 1°C/min, cycles: 2cycles |
| Humidity | 3 | 40 °C, 95%RH, 48h |
| Solder Ability | 15 | IPC J-STD-002C-2007 |

APPLICATION NOTES

Typical Application

Below is the typical application of the AVD75B-48S05 series power supply.

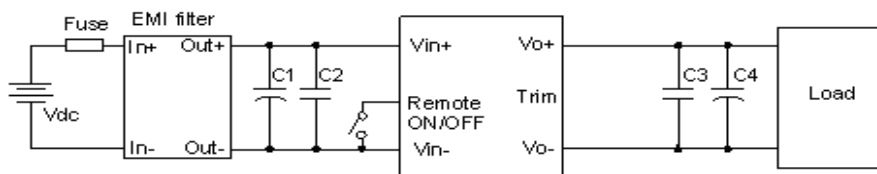


Figure 13 Typical application

C1: 100uF/100V electrolytic capacitor; P/N: UPM2A101MPD (Nichicon) or equivalent caps.

C2,C3: 1uF/100V X7R ceramic capacitor, P/N: C3216X7R2A105KT0L0S (TDK) or equivalent caps.

C4: 220uF oscon capacitor, P/N: CUXAE1C221M2BA(Sanyo).

Fuse: External fast blow fuse with a rating of 5A. The recommended fuse model is 0453005.MR from LITTLEFUSE.

Note: EMI filter: see Figure 18.

APPLICATION NOTES

Remote ON/OFF

Negative remote ON/OFF logic is available in AVD75B-48S05. The logic is CMOS and TTL compatible.

The voltage between pin Remote ON/OFF and pin Vin- must not exceed the range listed in Table 3 to ensure proper operation. The external Remote ON/OFF circuit is highly recommended as shown in Figure 14.

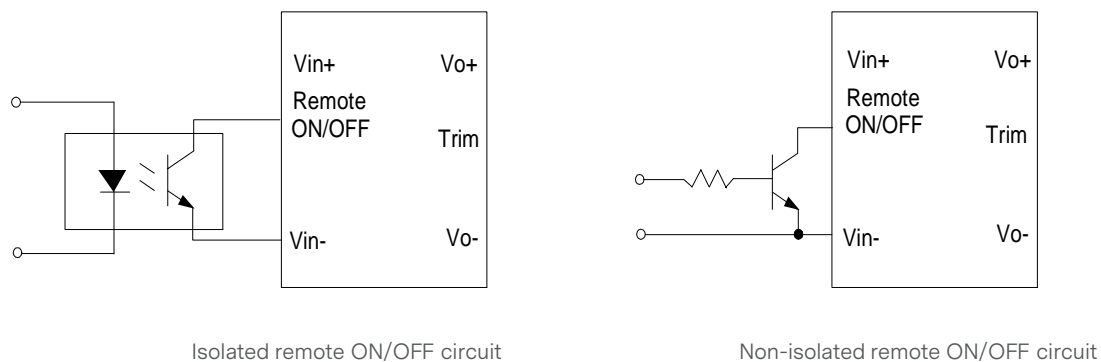


Figure 14 External Remote ON/OFF circuit

APPLICATION NOTES

Trim Characteristics

Connecting an external resistor between Trim pin and Vo- pin will decrease the output voltage. While connecting it between Trim and Vo+ will increase the output voltage. The following equations determine the external resistance to obtain the trimmed output voltage.

$$R_{adj-down} = \frac{510}{\Delta} - 10.2(K\Omega)$$

$$R_{adj-up} = \frac{5.1 \times V_{nom} \times (100 + \Delta)}{1.225 \times \Delta} - \frac{510}{\Delta} - 10.2(K\Omega)$$

Δ : Output rate against nominal output voltage.

$$\Delta = \frac{100 \times (V_{nom} - V_0)}{V_{nom}}$$

V_{nom} : Nominal output voltage.

For example, to get 5.5V output, the trimming resistor is

$$\Delta = \frac{100 \times (V_{nom} - V_0)}{V_{nom}} = \frac{100 \times (5.5 - 5)}{5} = 10$$

$$R_{adj-up} = \frac{5.1 \times 3.3 \times (100 + 10)}{1.225 \times 10} - \frac{510}{10} - 10.2 = 167.78(K\Omega)$$

When trimming up, the output current should be decreased accordingly so as not to exceed the maximum output power.

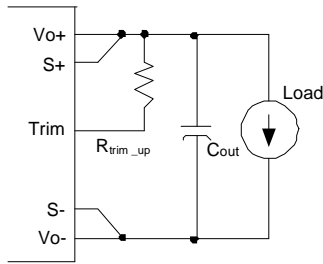


Figure 15 Trim up

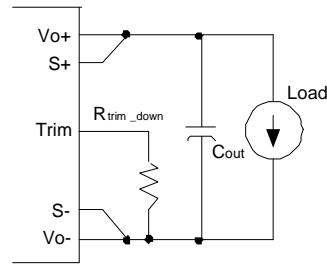


Figure 16 Trim down

If the sense compensate function is not necessary, connect S+ to Vo+ and S- to Vo- directly.

APPLICATION NOTES

Input Ripple & Output Ripple & Noise Test Configuration

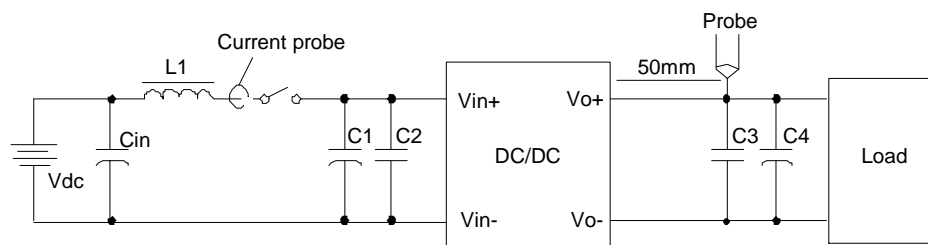


Figure 17 Input ripple & output ripple & noise test configuration

Vdc: DC power supply

L1: 12uH

Cin: 220uF/100V typical

C1 ~ C4: See Figure 13

Note: Using a coaxial cable with series 50Ω resistor and 0.68μF ceramic capacitor or a ground ring of probe to test output ripple & noise is recommended.

EMC Test configuration

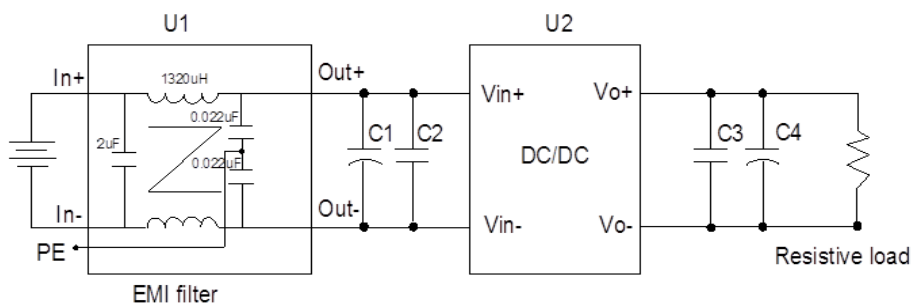


Figure 18 EMC Test configuration

U1: Input EMC filter

U2: Module to test, AVD75B-48S05

C1 ~ C4: See Figure 13

SOLDERING INFORMATION

Soldering

The AVD75B-48S05 series is intended for standard manual, reflow or wave soldering.

| | Product Requirement | Product Name |
|----|---------------------|-------------------------------------|
| R6 | Wave soldering | AVD75B-48S05B-6L AVD75B-48S05-6L |

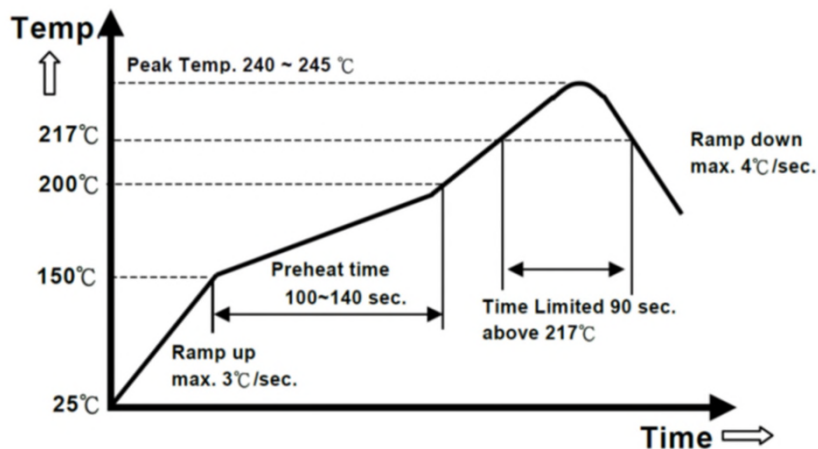
When wave soldering is used, the temperature on pins is specified to maximum 260 °C for maximum 7s.

When soldering by hand, the iron temperature should be maintained at 300 °C ~ 380 °C and applied to the converter pins for less than 10s. Longer exposure can cause internal damage to the converter. Cleaning of solder joint can be performed with cleaning solvent IPA or simulative.

The below products are intended for standard reflow soldering.

| | Product Requirement | Product Name |
|----|---------------------|-----------------------------------|
| R6 | Reflow soldering | AVD75B-48S05-6L AVD75B-48S05TL |

When reflow soldering is used, please refer to following fig for recommended temperature profile parameters.



RECORD OF REVISION AND CHANGES

| Issue | Date | Description | Originators |
|-------|------------|---|-------------|
| 1.0 | 08.04.2017 | First Issue | E. Wang |
| 1.1 | 12.18.2019 | Update soldering information | E. Wang |
| 1.2 | 02.24.2020 | Update RoHS status | C.Liu |
| 1.3 | 05.28.2020 | Update safety cert. from 60950 to 62368-1 | E. Wang |
| 1.4 | 11.15.2021 | Update format & OCP range | K.Ma |
| 1.5 | 08.18.2022 | Add weight information | E. Wang |



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